

What is Claimed is:

1. A distributed bus differential relay system for an electric power distribution system comprising a bus, a plurality of feeder lines including at least one feeder line supplying power to said bus and the remaining feeder lines connected to  
5 draw power from said bus, and a plurality of circuit breakers each connecting an associated one of said feeder lines to said bus, said relay system comprising:
  - a plurality of current transformers each measuring current in an associated feeder line;
  - a set of leads connecting said plurality of current transformers  
10 in parallel; and
  - a plurality of differential relay elements connected across said set of leads and associated with one of said circuit breakers for tripping the associated circuit breaker in response to predetermined voltage conditions across said set of leads.
- 15 2. The system of Claim 1 wherein said differential relay elements include voltage responsive devices which trip the associated circuit breaker in response to a persistent voltage across said leads above a predetermined value.
3. The system of Claim 1 wherein said bus and feeder lines are multi-phase, said current transformers comprise a current transformer associated with  
20 each phase of each feeder line, said set of leads comprises phase leads connecting said current transformers associated with each phase in parallel, and said differential relay elements comprise multi-phase differential relay elements associated with each circuit breaker and connected across each of said phase leads and responsive to  
predetermined voltage conditions across any of said phase leads to trip the associated  
25 circuit breaker.
4. The system of Claim 1 wherein said circuit breakers have low energy trip devices and said differential relay elements are powered by the associated current transformer and generate a low energy trip signal which trips the low energy trip device of the associated circuit breaker.
- 30 5. The system of Claim 4 wherein each circuit breaker has an overcurrent relay which actuates said low energy trip device in response to certain

conditions of measured current and said current transformers associated with each feeder line provide measured current to the overcurrent relay of the associated circuit breaker.

6. The system of Claim 5 wherein said differential relay element  
5 is incorporated into said overload relay of the associated circuit breaker.

7. The system of Claim 6 wherein said overload relay is a microprocessor based overload relay.

8. The system of Claim 1 wherein each circuit breaker includes an overcurrent relay which trips the circuit breaker in response to certain conditions of  
10 measured current and wherein said current transformers associated with each feeder line provide measured current to the overcurrent relay of the associated circuit breaker.

9. The system of Claim 1 wherein said at least one of said differential relay elements includes a voltage limiting device connected to limit  
15 voltage across said set of leads to a preselected voltage.

10. The system of Claim 9 wherein said at least one of said differential relay elements further includes a shorting device shorting said voltage limiting device after a period of time sufficient for said circuit breakers to be tripped in response to a fault on said bus.

11. The system of Claim 9 wherein each of said differential relay elements includes a voltage limiting device.

12. The system of Claim 11 wherein each of said differential relay elements includes a shorting device.

13. The system of Claim 9 wherein said voltage limiting device  
25 comprises a varistor.

14. The system of Claim 13 wherein said at least one differential relay element includes a shorting device shorting said varistor after a period of time sufficient for said circuit breakers to be tripped by said differential relay elements in response to a fault on said bus.

15. The system of Claim 14 wherein said shorting device integrates  
30 with respect to time voltage on said leads above said preselected voltage.

16. The system of Claim 15 including a resistor in series with said varistor across said set of leads.